Space Weather Technical Forecast

Issued on Thursday, 21 October 2021 at 01:13 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: No significant activity expected.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity was Very Low, but the background x-ray flux has been slowly rising over the last 24 hours, with a B-class flare recently. This is likely to be due to a potential new region rotating onto the southeast limb, currently visible on STEREO-A imagery. Otherwise, there is currently one numbered sunspot region on the visible disc, AR2886 (Hsx/Alpha) in the southeast quadrant. This region appears to be stable with a magnetically simple configuration. No new Earth-directed CMEs were observed in available imagery in the last 24 hours.

Solar Wind / Geomagnetic Activity: Solar wind speeds, as measured by DSCOVR at L1, were at ambient to slightly elevated levels, varying between 370-420 km/s, but with a steady rise to reach elevated levels around 520 km/s since 20/1830 UTC. Density values were mainly above average, with a peak of 22 ppcc at 20/1813 UTC. Total IMF, Bt, was weak to start, but increased around 20/1400 UTC varying between 5-8 nT, then increased again to moderate after 20/2030 UTC. Bz varied weakly for much of the period, but started to vary between +6/-6 nT after 20/1945 UTC. The Phi angle has been mainly negative (towards the Sun) with a rotation towards the positive sector between 20/0920-1415 UTC. Resultant geomagnetic activity was Quiet (Kp 0-2). These parameters suggest a recent connection to the high speed stream from a negative coronal hole, likely CH13/-.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) as measured by GOES-16 was at background levels, with no solar radiation storms observed. High energy electron flux (greater than 2 MeV) was at background levels. Associated 24-hour electron fluence was on a fairly steady trend, well below the Active (1e8 integrated pfu) threshold, with 1.59e6 integrated pfu recorded at 21/0000 UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be at low or very low levels through the next few days, perhaps with an increase in flare probabilities as a new region rotates onto the southeast limb.

Solar Wind / Geomagnetic Activity: Solar wind speeds are currently at elevated levels due to a connection to CH13/-. This is likely to continue over the next 24 hours, before slowly declining through Days 2 and 3 (22-23 Oct). A weak CME may glance Earth at first, but no significant effects are expected. Geomagnetic activity is likely to be Quiet to Unsettled, with isolated Active intervals on Days 1 and 2, and a very slight chance of isolated G1/Minor geomagnetic storms on Day 1.

Energetic Particles / Solar Radiation: The high energy (greater than 10 MeV) proton flux is expected to remain at background levels, with no solar radiation storms expected. The high energy electron flux (greater than 2MeV) is currently at background levels, but may show a rising

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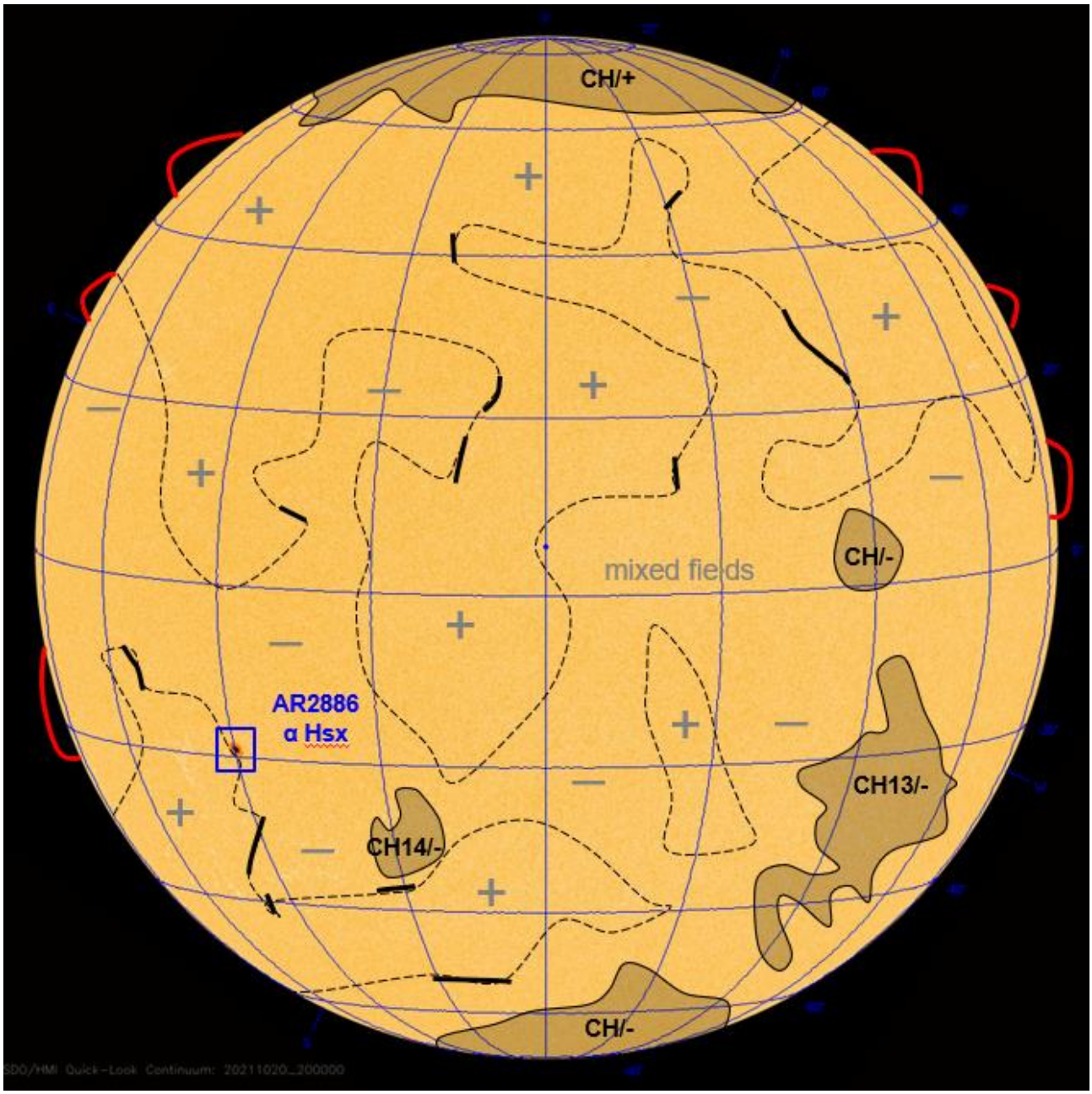
trend through the next 4 days as the fast wind from CH13/- charges the radiation belts. The 24-hour fluence may also show a rising trend, with a chance of reaching the Active (1e8 integrated pfu) threshold by the end of Day 4 (24 Oct).

Figure 1. Solar Analysis Valid 20/2000 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

A faint CME that was associated with a weak filament lift off from near N30W10 at 17/0739 UTC has been re-analysed. Model results show a possible small chance of a glancing blow at the start of this period, but confidence is low and no significant impacts are expected.

Solar wind speeds are currently at elevated levels, likely due to coronal hole influence from CH13/-. We saw wind speeds up to 550 km/s on the previous rotation and despite changes in the shape of the coronal hole, similar wind speeds are likely again. The hole is slightly more advanced than on the previous rotation and as such wind speeds are likely to peak on Day 1 (21 Oct), with a steady decline during Day 2, perhaps into Day 3 (22-23 Oct).

Geomagnetic activity is likely to be Quiet to Unsettled, with isolated Active intervals on Days 1 and 2, and a very slight chance of isolated G1/Minor geomagnetic storms on Day 1.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	1	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Date/time 21.5R (UTC)	Halo: Full or Partial	Source	Source Location	Estimated Speed	Estimated Arrival Time	Comments
17/1506 UTC	Partial	Filament eruption	N30 W10	500 km/s	21/0000 UTC	Faint CME. Low confidence. No significant impacts expected.

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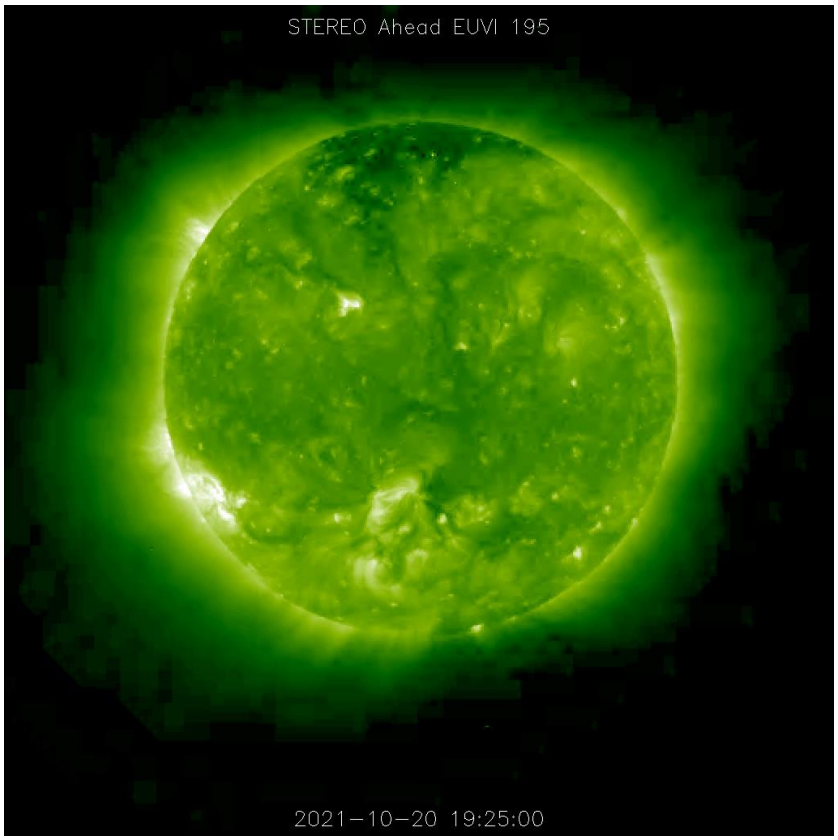
Radio Blackouts - X-Ray Flares:
Solar activity is expected to be at low or very low levels through the next few days.
There is one numbered sunspot region on the visible disc at present, AR2886 (Hsx/Alpha), located in the southeast quadrant. This region appears to be stable at present and has not produced any notable flares in the past 24 hours. However, a bright region of flux observed in STEREO-A EUVI imagery is likely to be a new region, rotating onto the southeast limb of the visible disc in the next 24 hours. This region is already responsible for an increase in the background levels of x-ray flux. As such, the probability of flaring is likely to increase over the next few days.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	1	2	2	2
Very Active	R3 to R5 X Class	No	1	1	1	1

Figure 2: STEREO-A imagery showing a bright flux region rotating onto the southeast limb.



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Solar Radiation Storms - (High Energy Protons):

With no significant flare activity forecast for this period, and then only sunspot currently in the eastern hemisphere, solar radiation storms are not expected.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	1	1	1	1
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

The high energy (greater than 2 MeV) electron flux is currently at background levels. The recent arrival of a high speed stream from CH13/- is likely to keep electron levels suppressed through the early part of the period as the radiation belts are likely to be compressed from the faster solar wind speeds. However, this increase in wind speeds may drive an increase in flux levels, which may then give a flux increase at GEO later in the period. Flux levels rose on the previous rotation, but not above the High (1000 pfu) level.

The electron fluence is currently well below the Active (1e8 integrated pfu) threshold on a steady trend. Fluence levels may rise through this period as the high speed stream effects wane. There is a chance of seeing fluence above the Active threshold by the end of Day 4 (24 Oct). REFM is not currently indicating an increase in fluence levels, but this may be due to the lack of response on the previous rotation and is potentially somewhat under-estimating fluence levels.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	10	20	30
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

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